TITLE 180 CONTROL OF RADIATION

CHAPTER 9 RADIATION SAFETY REQUIREMENTS FOR PARTICLE ACCELERATORS

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9-001 SCOPE AND AUTHORITY:

9-001.01 180 NAC 9 establishes procedures for the registration and use of particle accelerators. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3519.

9-001.02 In addition to the requirements of 180 NAC 9, all registrants are subject to the requirements of 180 NAC 1, 2, 4, 10, 15, 17 and 18. Registrants engaged in industrial radiographic operations are subject to the requirements of 180 NAC 5. Registrants engaged in the healing arts are subject to the requirements of 180 NAC 6 and/or 180 NAC 7. Registrants whose operations result in the production of radioactive material are subject to the requirements of 180 NAC 3.

REGISTRATION PROCEDURE

9-002 REGISTRATION REQUIREMENTS: Any person intending to\ receive, possess, use, transfer, own, or acquire a particle accelerator must be authorized in a registration issued pursuant to 180 NAC 2.

9-003 GENERAL OPERATING REQUIREMENTS FOR THE ISSUANCE OF A REGISTRATION FOR PARTICLE ACCELERATORS: In addition to the requirements of 180 NAC 2, registration application for use of a particle accelerator will be approved only if the Agency determines that:

1. The applicant has appointed a radiation safety officer;
2. The applicant has established a radiation safety committee to approve, in advance, proposals for use of a particle accelerator(s);
3. The applicant's proposed or existing equipment, facilities and operating and emergency procedures are adequate to protect health and minimize danger to public health and safety or property as required in 180 NAC 9-004 through 9-010;
4. The applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with 180 NAC 9 and 180 NAC 4 and 10 in such a manner as to minimize danger to public health and safety or property;
5. The issuance of the registration will not be inimical to the health and safety of the public, and the applicant satisfies any applicable special requirement in 180 NAC 9-004, and
6. The applicant and/or the applicant's staff has training and experience in the use of particle accelerators as specified in 180 NAC 15.

9-004 HUMAN USE OF PARTICLE ACCELERATORS: In addition to the requirements of 180 NAC 2, a registration for use of a particle accelerator in the healing arts will be issued only if:

1. The applicant has appointed a radiation safety committee of at least three members to oversee the use of the particle accelerator, and to review the institution's radiation safety program. Membership of the committee should include at least the following: an authorized user, a representative of the institution's management and the Radiation Safety Officer.
2. The individuals designated on the application as the users have training and experience as designated in 180 NAC 15-005 in deep therapy techniques or in the use of particle accelerators to treat humans; and
3. The individuals designated on the application as the users are physicians.
4. Any applicant employing Radiation Therapists to perform radiation therapy procedures must require that they have training and experience requirements as specified in 180 NAC 15-021.

RADIATION SAFETY REQUIREMENTS FOR THE USE OF PARTICLE ACCELERATORS

9-005 OPERATOR QUALIFICATIONS: Any person intending to operate an accelerator must meet the training requirements of 180 NAC 15-024 (accelerators under 1 MeV) or 180 NAC 15-025 (non-human use accelerators above 1 MeV).

9-006 LIMITATIONS

1. No registrant must permit any individual to act as an operator of a particle accelerator until such individual:

   a. Has been instructed in radiation safety and must have demonstrated an understanding thereof;
   b. Has received copies of and instruction in 180 NAC 9 and the applicable requirements of 180 NAC 4 and 10, pertinent registration conditions and the registrant's operating and emergency procedures, and must have demonstrated understanding thereof; and
   c. Has demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be employed.

2. The radiation safety committee or the radiation safety officer must have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to minimize danger to public health and safety or property.

9-007 SHIELDING AND SAFETY DESIGN REQUIREMENTS

9-007.01 A radiological physicist as specified in 180 NAC 15-013.01 or 15-013.02 must be consulted in the design of a particle accelerator installation, must submit a plan review prior to construction and must perform a radiation survey when the accelerator is first capable of producing radiation. A copy of the survey results must be submitted to the Agency for review.

9-007.02 Each particle accelerator installation must be provided with such primary and/or secondary barriers as are necessary to assure compliance with 180 NAC 4-005 and 4-013.

9-008 PARTICLE ACCELERATOR CONTROLS AND INTERLOCK SYSTEMS

9-008.01 Instrumentation, readouts and controls on the particle accelerator control console must be clearly identified and easily discernible.

9-008.02 Each entrance into a target room or other high radiation area must be provided with a safety interlock(s) that shuts down the machine under conditions of barrier penetration.

9-008.03 When a safety interlock system has been tripped, it must only be possible to resume operation of the accelerator by manually resetting controls at the position where the safety interlock has been tripped, and lastly at the main control console.

9-008.04 Each safety interlock must be on a circuit which must allow its operation independently of all other safety interlocks.

9-008.05 All safety interlocks must be designed so that any defect or component failure in the safety interlock system prevents operation of the accelerator.

9-008.06 A scram button or other emergency power cutoff switch must be located and easily identifiable in all high radiation areas. The cutoff switch must include a manual reset so that the accelerator cannot be restarted from the accelerator control console without resetting the cutoff switch.

9-009 WARNING DEVICES

9-009.01 Each location designated as a high radiation area, and each entrance to such location, must be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.

9-009.02 Except in facilities designed for human exposure, each high radiation area must have an audible warning device which must be activated for 15 seconds prior to the possible creation of such high radiation area. Such warning device must be clearly discernible in all high radiation areas and all radiation areas.

9-009.03 Barriers, temporary or otherwise, and pathways leading to high radiation areas must be identified in accordance with 180 NAC 4-033.

9-010 OPERATING PROCEDURES

9-010.01 Particle accelerators, when not in operation, must be secured to prevent unauthorized use.

9-010.02 The safety interlock system must not be used to turn off the accelerator beam except in an emergency.

9-010.03 All safety and warning devices, including interlocks, must be checked for proper operation at intervals not to exceed six months. Results of such tests must be maintained at the accelerator facility for inspection by the Agency.

9-010.04 Electrical circuit diagrams of the accelerator and the associated interlock system must be kept current and maintained for inspection by the Agency and must be available to the operator at each accelerator facility.

9-010.05 If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action must be:

1. Authorized by the radiation safety committee and/or radiation safety officer;
2. Recorded in a permanent log and a notice posted at the accelerator control console; and
3. Terminated as soon as possible.

9-010.06 A copy of the current operating and emergency procedures must be maintained at the accelerator control panel.

9-011 RADIATION MONITORING REQUIREMENTS

9-011.01 There must be available at each particle accelerator facility appropriate portable monitoring equipment which is operable and has been appropriately calibrated, for the radiation being produced at the facility. The equipment must be tested for proper operation daily and calibrated at intervals not to exceed one year and after each servicing and repair.

9-011.02 A radiation protection survey must be performed, and documented by a radiological physicist as specified in 180 NAC 15-013.01 or 15-013.02, when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

9-011.03 Radiation levels in all high radiation areas must be continuously monitored. The monitoring devices must be electronically independent of the accelerator control and safety interlock systems and capable of providing a readout at the control panel.

9-011.04 All area monitors must be calibrated at intervals not to exceed one year and after each servicing and repair.

9-011.05 Whenever applicable, periodic surveys must be made to determine the amount of airborne particulate radioactivity present.

9-011.06 Whenever applicable, periodic smear surveys must be made to determine the degree of contamination.

9-011.07 All surveys must be made in accordance with the written procedures established by a radiological physicist as specified in 180 NAC 15-013.01 or 15-013.02, or the radiation safety officer.

9-011.08 Records of all radiation protection surveys, calibration and instrumentation tests, must be maintained at the accelerator facility for inspection by the Agency.

9-012 VENTILATION SYSTEMS

9-012.01 Ventilation systems must be provided to ensure that personnel entering any area where airborne radioactivity may be produced will not be exposed to airborne radioactive material in excess of those limits specified in 180 NAC 4, Appendix 4-B, Table I.

9-012.02 A registrant, as required by 180 NAC 4-014, must not vent, release or otherwise discharge airborne radioactive material to an unrestricted area which exceed the limits specified in 180 NAC 4, Appendix 4-B, Table II, except as authorized pursuant to 180 NAC 4-014 or 4-040. For purposes of 180 NAC 9-012.02, concentrations may be averaged over a period of not greater than one year. Every reasonable effort should be made to maintain releases of radioactive material to unrestricted areas as far below these limits as is reasonably achievable.

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